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pg. 2

# FOOT ROT OF SHEEP

Farmers' Bulletin No. 2206 U.S. DEPARTMENT OF AGRICULTURE



**COVER: Trimming foot of a sheep with foot rot. With a sharp knife, worker pares away overgrown hoof and diseased tissue.**

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*Prepared by*

Veterinary Sciences Research Division,  
Agricultural Research Service and  
Animal Health Programs of Veterinary Services,  
Animal and Plant Health Inspection Service

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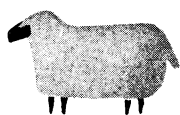
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# FOOT ROT OF SHEEP

Contagious foot rot is a major problem in many sheep-producing areas of the United States. Sheep seldom can be grown economically if the flock has foot rot.

This infectious disease destroys the tissues that connect the horny cover of the sheep's hoof with the soft underlying tissues, causing the outer horn to separate from the hoof. Infected animals become lame and unthrifty. Future hoof growth is distorted, but the infection does not spread above the hoof.

Sheep of all ages and all breeds are susceptible.

Foot rot in sheep is not the same disease as foot rot in cattle. The two diseases are caused by different organisms, are distinguished by different types of lesions, and are treated by different methods.

Foot rot can be eliminated from an infected flock only if treatment is continued until every infected sheep has been cured or has been disposed of. This requires—

- Repeated examination, trimming, and use of disinfectant.
- Strict isolation of infected and suspected animals.
- Disposal of carriers.

This costly sheep disease is easier to prevent than to eradicate. A clean flock can be protected from foot rot through careful management. Prevention requires that every newly introduced sheep be isolated until it is shown to be free of foot rot.

## CAUSE

Contagious foot rot is a bacterial infection of sheep. Its primary cause is the organism *Fusiformis nodosus*. However, another organism—*Spirochaeta penortha*—also is present in the feet of sheep that have typical foot rot infections.

Foot rot bacteria enter the foot through injuries, irritated areas, and other breaks in the skin. After these bacteria produce an initial lesion, other bacteria may invade the foot tissues.

Foot rot bacteria are able to live for months in the flesh of a sheep's foot. In contrast, they cannot survive for more than 2 weeks in the ground, on pastures, or in other environments away from animal tissues.

## SPREAD

Infected sheep spread foot rot by contaminating the premises they use—grounds, pastures, corrals, sheds, barn



floors, and truck beds. Noninfected sheep being grazed or handled on contaminated premises readily pick up the infection.

Foot rot carriers are not noticeably lame or diseased, but they continuously spread the bacteria. Some carrier sheep have deep pockets of infection beneath normal-looking claws. Others have overgrown hoofs, or claws that are twisted and deformed. Carrier sheep cannot be readily cured; they should be identified and sent to slaughter.

If conditions are favorable, one infected sheep or one carrier can introduce foot rot into a clean flock. Purchased rams often spread the infection.

Foot rot becomes established quickly. Pastures, ranges, barns, and lots are a continuing source of infection as long as diseased sheep contaminate them. Premises do not remain infective for more than 2 weeks after the infected flock is removed, however.

Before foot rot can develop, the bacteria must enter the foot. Any break in the skin—no matter how small—can provide an invasion route for foot rot bacteria. Breaks may be caused by abrasions, bruises, roundworm larvae that penetrate the foot, or injuries. Foot injuries often occur when sheep are driven through tall wet grass, over hard ground, or over rough, rocky areas.

Certain conditions increase the chances of an outbreak of foot rot:

- **Wet pastures and lots.** When sheep are held on wet ground for long periods, their feet are more subject to breaks. The skin becomes irritated, softened, and—often—injured by grit, mud, manure, litter, or other wet materials that pack between the claws. If foot rot bacteria are present, sheep with injured feet readily pick up the infection. This is the basis for the

common—but mistaken—belief that wet pastures are the cause of foot rot.

- **Overgrown hoofs.** When hoofs are not properly trimmed, the feet become distorted and misshapen. The foot itself develops pockets and crevices. If foot rot bacteria get into the foot, these pockets can harbor the infection for long periods. Sheep with badly overgrown feet often are carriers of foot rot.

In dry seasons, infected sheep may seem to recover. However, unless infected sheep have been properly treated and the infection eliminated, foot rot reappears during the next wet season.

## SIGNS

Lameness usually is the first indication of an outbreak of foot rot. Sheep begin to have trouble walking and standing about 10 to 14 days after they become infected. In a diseased foot, both claws may develop signs of infection. Foot rot may be localized in one foot, or may be found in all four feet. When both forefeet are affected, a sheep may feed on its knees.

### Early Stage

In the earliest stage of foot rot, the skin between the claws becomes reddened. A small moist area forms on the inner face of the claw or on the bulb of the heel. As the infection spreads, it underruns the thin, soft horn.

### Intermediate Stage

After an additional 2 to 4 weeks, the disease is well developed and relatively easy to detect by examining the infected foot. The diseased sheep is noticeably lame. Infection has undermined the sole and has extended under the walls of the hoof.

The horn is partly separated from the soft tissues beneath. There is a



**Trimming of healthy—but overgrown—claws.**

dirty gray, moist zone of dead tissue with a slimy appearance beneath the loose horn. Infected tissues have a sharp, disagreeable odor.

### **Advanced Stage**

In the advanced stage, the infection completely undercuts the horny wall and the sole of one or both claws. The horn is attached only at the coronet; it becomes overgrown, then deformed and distorted. The separated sole and the infected pocket beneath it may be easily overlooked. To find this condition, tap on the sole or probe the sole with a knife.

Foot rot may persist in chronic form for long periods. It does not spread to the area above the coronary band; the leg does not become infected. There is little pus and no swelling.

### **DETECTION**

As soon as a sheep shows signs of lameness, catch and examine it. Lame-

ness is a major sign of foot rot, but it also is a sign of many other diseases and abnormal conditions.

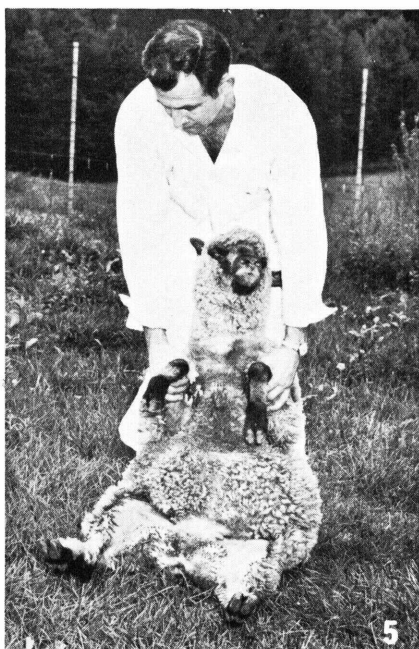
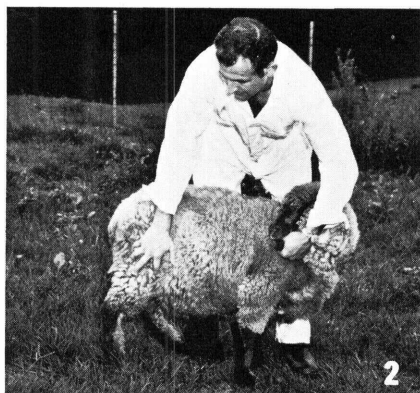
Conditions that often are confused with foot rot include bumblefoot (non-contagious foot rot), foot abscess, foot scald, contagious ecthyma (sore mouth), bluetongue, lip and leg ulceration, foot-and-mouth disease, arthritis, foot injuries, and foreign objects—such as stones or sticks—in the foot.

When in doubt about the cause of lameness in sheep, call your veterinarian or State animal-disease-control officials for a diagnosis.

In addition to diagnosing foot rot or verifying your diagnosis, your veterinarian can also—

- Help you plan a treatment schedule for your flock.
- Teach you proper methods of foot trimming.





**1** Catch sheep in loose flesh of flank between upper back leg and body where wool is thin. Then place your left hand under its jaw and your right hand over dock, with sheep's left side against your shins.

**2** Slip your left thumb into its mouth back of incisor teeth, and move your right hand to sheep's right hip.

**3** Hold lower jaw tightly. Bend sheep's head sharply over its right shoulder as you press your right hand down and swing sheep toward you.

**4** Lower sheep to ground as you step back. Or catch it between your legs (not shown).

**5** Sheep is set up for foot rot examination and trimming. (Also see cover.)

- Reexamine treated animals.
- Identify the probable foot rot carriers, which should be removed from the flock and sold for slaughter.

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**Before starting the foot-bath treatment, free the premises—pastures, lots, or buildings—of foot rot bacteria. To do this, remove all sheep for 2 weeks. Then, while sheep are undergoing treatment, use only the clean pastures, lots, and buildings as holding areas.**

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## TREATMENT

Getting rid of foot rot requires both time and effort. In the long run, it is less costly to free a flock of foot rot than it is to live with the disease.

Because the disease is so highly contagious, foot rot must be considered a flock problem. A single treatment of a few obviously infected sheep does little good because it does not remove the source of infection. While some early cases of foot rot can be cured by intramuscular injections of tetracycline, this drug will not free an infected flock of the disease.

The only known way to eliminate foot rot from a flock is to treat sheep by walking them through a foot bath containing a suitable disinfectant, and continuing the treatment at frequent intervals until all infected feet are healed or animals are disposed of. Two treatment schedules for infected farm flocks are given (see pp. 13-16).

Begin your treatment as soon as possible after foot rot is diagnosed. Do not postpone treatment until the beginning of the dry season. It is relatively easy to cure recently infected feet, but difficult to cure long-standing cases of foot rot. An owner usually is money ahead by sending sheep with badly deformed feet to slaughter.



**Badly diseased foot.**

**Do not stop treatment too soon. A treatment schedule will be effective only if it is continued until all sheep in the flock are cured or disposed of.**

Once foot rot is diagnosed in a flock, all sheep must be considered infected until their feet have been examined, trimmed, and treated.

Research in Australia shows that a vaccine containing *Fusiformis nodosus* can protect sheep against foot rot. Two injections were necessary in preliminary vaccine trials and further testing is required to determine the feasibility of the vaccine for field use.

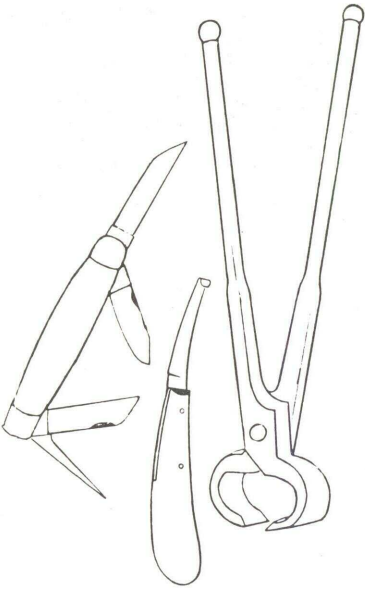
## Examining

Before looking at individual feet, divide the flock into two groups—one with apparently clean sheep and the other with sheep that are visibly lame or infected. Keep the groups separated.

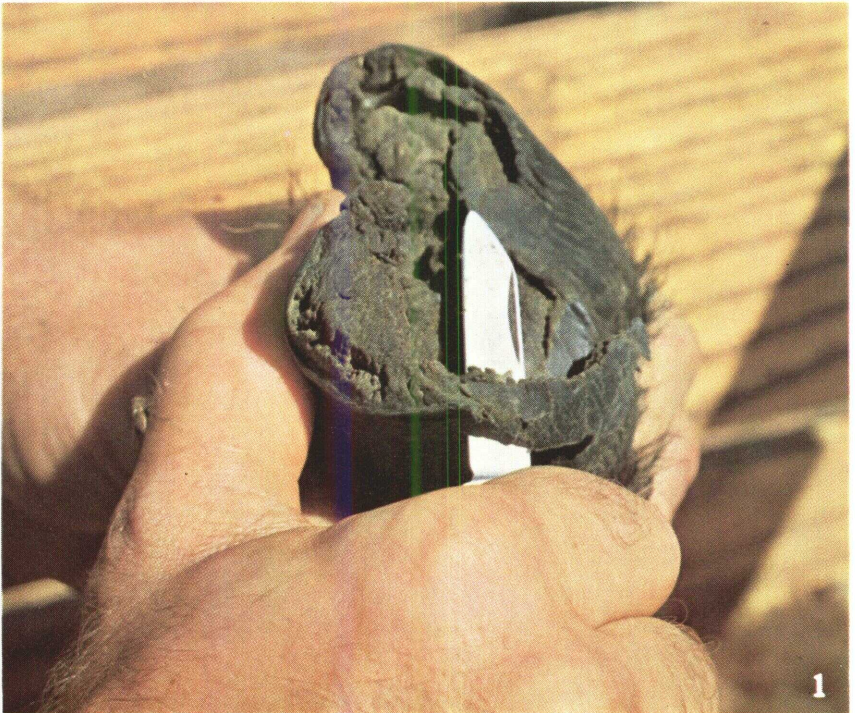
Handle every sheep gently to minimize damage to wool and tender flesh. Catch sheep in the loose flesh of the flank between the upper part of the back leg and the body where there is little or no wool.

**Inspect every sheep in the flock—including those that show no signs of lameness.**





## HOW TO TRIM FOOT OF A SHEEP WITH FOOT ROT

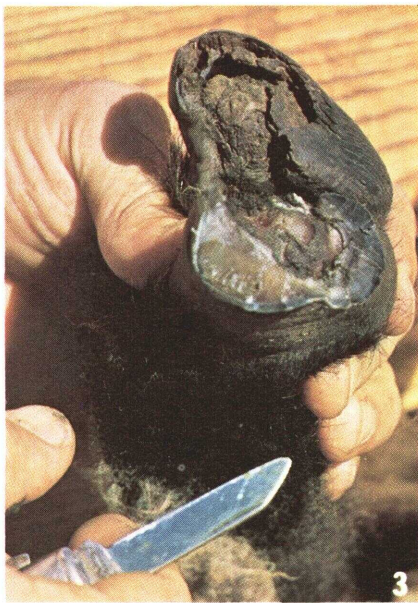


Begin by examining each foot separately. Trim overgrown parts of hoof with a sharp knife. Remove ragged and separated horn from diseased hoof.





**Probe for hidden or deep pockets of infection with the point of a knife, or locate pockets of infection by tapping on the sole.**



**Cut out all diseased tissue and pockets of infection. Sometimes, this requires cutting through healthy tissue and drawing blood.**



**Reexamine the foot when all diseased tissue is removed. (Compare top claw—before trimming—with bottom claw—after trimming.)**



**Before releasing sheep, swab all newly trimmed tissue with fresh disinfectant. Then send the treated sheep through foot bath.**

Then set up each sheep (p. 6) or put it in a sheep cradle (below). A metal cradle holds a sheep securely so that the feet can be examined and trimmed more easily; it is especially useful in handling large sheep. Cradles may be made on the farm or purchased at farm supply stores.

When the sheep is set up, examine each foot individually. Unless every foot of every animal in the flock is examined, some pockets of foot rot may go undetected. These will be centers of reinfection.

## Trimming

Trimming is a separate step. While the sheep is off its feet, examine the feet for foot rot, trim them, reexamine, and—if necessary—retrim.

Several tools may be used for trimming sheep's hoofs. These include—

- A pocketknife or a jackknife with a medium-sized blade.

- A hoof knife.
- Foot-rot shears, pruning shears, or florist shears.
- Hoof nippers.
- File or rasp.

**Be sure the cutting edge is sharp.** After trimming each hoof, disinfect the knife or shears by washing in soap and water and then dipping into a small container of disinfectant.

Burn all foot rot parings; they contain foot rot bacteria.

## Clean Sheep

Trim each hoof as necessary to remove overgrown parts and to prevent excessive future growth.

After trimming, examine each foot carefully. Look for diseased or dead tissue, for infected areas, and for under-run horn. Tap on the sole with the back of the knife. If you find any abnormal or unusual condition, pare the hoof to expose the site of the trouble. If the sheep is infected, move it to the infected group.

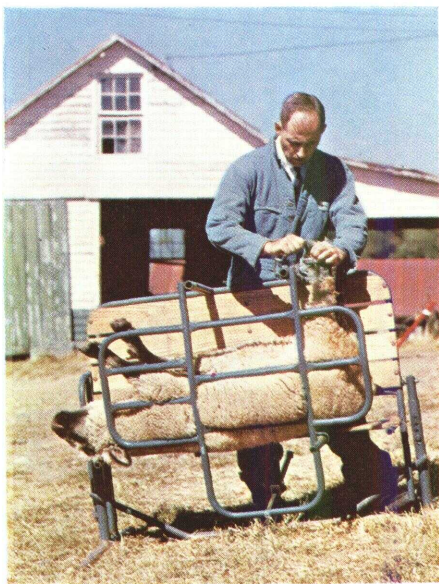
## Infected Sheep

Trim all overgrown parts of each hoof.

Pare all ragged or separated horn and sole. Remove all horn or sole covering infected areas and pockets.

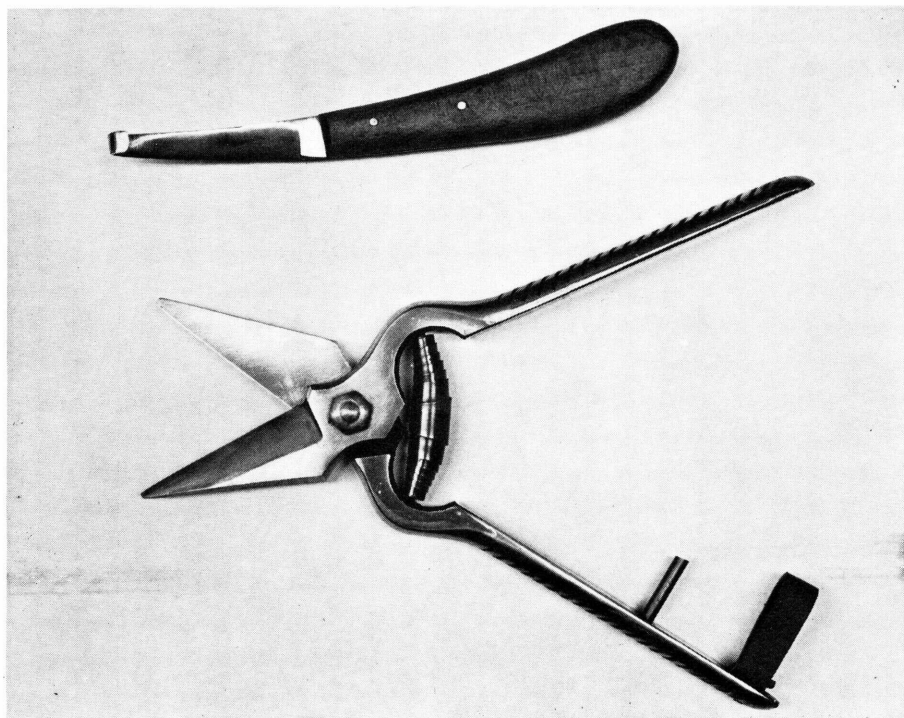
Pare a little diseased tissue at a time, until you have removed every pocket, crevice, and crack from the infected foot. Cut off all tissue that has separated from the foot and all tissue that shows evidence of infection.

Probe carefully for hidden or deep pockets of infection. If necessary, cut healthy tissue to reach the infected area. After trimming, reexamine the foot to make sure all diseased tissue has been removed.



A metal cradle for holding sheep during examination and trimming of feet.





Tools for trimming: Hoof knife (top), foot-rot shears.

## Hand Treating

Before releasing an infected sheep, hand treat the feet by swabbing all the newly trimmed tissue with disinfectant. Fill a jar or enamel pan with fresh disinfectant when the foot bath is mixed (see p. 13). Or combine equal parts of commercial (40 percent) formalin and glycerin. Or prepare a saturated solution of copper sulfate in water.

Use a stiff brush or a round 1-inch paint brush to apply disinfectant liberally to all areas of the foot that have been exposed in trimming.

All of the recommended disinfectants go to work immediately on contact with exposed tissues. This is the value of the prebath treatment.

## Foot Bath

The foot bath should be located outdoors. A suggested arrangement is shown on page 12. The foot bath should include the following parts, connected in the order listed—

- An examining and trimming area.
- Separate holding pens for clean sheep and infected sheep.
- Trough(s) for water bath.
- Trough(s) for disinfectant bath.
- A drain pen.

If it is possible, place the foot bath where sheep will have to go through the troughs of disinfectant to reach their normal feeding areas. Set up panels or fences to prevent sheep from jumping over or going around the troughs. With such an arrangement, sheep seldom have to be driven through the bath.

## Construction

The troughs for the foot bath may be constructed of wood, plastic, or concrete. They are narrow, shallow vats with sloping sides.

The first trough holds a water bath, where much of the dirt and organic material will be washed off the sheep's feet. Identical troughs hold the disinfectant.

One trough for water and one for disinfectant is sufficient to treat a small farm flock. For larger numbers of sheep, use two water-bath troughs and several disinfectant troughs, placed end to end. Secure panels along both sides of the trough to form a chute.

Each trough or section should be 12 feet long, 12 inches high, 8 inches wide at the bottom, and 12 inches wide at the top. The end closure of the trough should be 6 inches high, so that sheep can move easily in and out of the bath.

One trough of this size—when filled to a depth of 4 inches—holds 20 gallons of liquid.

Construct the floor of the drain pen of concrete or wood.

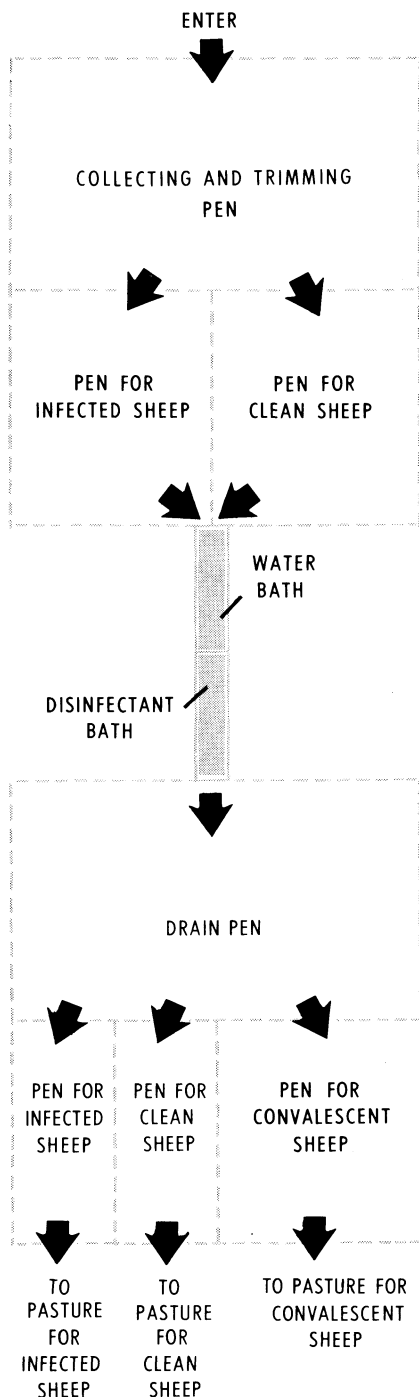
## Water

For the water bath, fill the trough with clean water to a depth of 4 inches. If dirt and organic material on the sheep's feet are carried into the disinfectant bath, they will reduce the effectiveness of the treatment. Change the water and remove trash from the trough as often as necessary to keep water clean.

The water bath should be used during the dry months to wash away debris and to soak feet prior to trimming.

## Disinfectant

After feet have been examined and trimmed, **all** sheep in the infected flock must go through a disinfectant bath.



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## PRECAUTIONS

Formalin and copper sulfate are poisonous both to man and to animals. Handle them with care. Read the label and heed all precautions.

If you get disinfectant on exposed skin, wash it off immediately with soap and water.

Do not let sheep drink from the disinfectant bath or lie down in it.

Do not use formalin or copper sulfate where the chemical can contaminate feed or water. Do not empty disinfectant where it will contaminate ponds, streams, or underground water supplies, or where it will attract children, pets, birds, or livestock.

Do not use or store copper sulfate in a metal container or in a wooden container constructed with nails.

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The disinfectant promotes healing when it comes in direct contact with infected foot tissues that have been exposed during trimming.

The disinfectant may be either formalin or copper sulfate (bluestone). They are equally effective when properly used.

The advantages of formalin:

- It does not deteriorate in the bath.
- It does not stain wool.
- It can be safely used in metal troughs, in wooden troughs built with nails, and in troughs made of other recommended materials.

Formalin solutions give off fumes that are disagreeable both to the operator and to sheep. For this reason, formalin should be used in the open—not in a barn or other closed space.

Prepare a 10-percent formalin solution by adding 2 gallons of formalin to 18 gallons of water.

Copper sulfate does not have objectionable fumes. It corrodes metals and nails. If splashed onto sheep, it leaves a green stain that will reduce the value of the fleece.

Prepare a 20-percent copper sulfate solution by mixing 32 pounds of copper sulfate with 20 gallons of water. Hot water will speed up the dissolving action. If water is excessively hard, add vinegar or commercial-grade glacial acetic acid as necessary to get the copper sulfate into solution. Make sure that all the copper sulfate is dissolved.

Refill trough as necessary to maintain disinfectant at original level.

Change disinfectant when it becomes excessively dirty.

## Procedure

Keep clean and infected sheep separated. Send the clean group through the foot bath first.

Water sheep before putting them through the foot bath.

Sheep must stand with all feet in disinfectant bath at least **4 minutes** for the treatment to be effective.

Make sure that sheep do not hold one foot out of the bath.

Do not allow sheep to run through the bath.

Do not crowd sheep into the troughs.

After treatment, hold sheep in a concrete or wooden drain pen for several minutes. Then move them to clean pasture; keep infected sheep isolated from the convalescent group and the clean group.

## TREATMENT SCHEDULES

### Two-Week Schedule

A recommended schedule for treating an infected farm flock over a 2-week period is given on page 14.



### **First day**

- Set up and examine all sheep.
- Trim all feet; probe for pockets of infection.
- Hand treat infected feet.
- Sort the flock into two groups—a healthy (clean) group and an infected group.
- Put the clean group through foot bath.
- Isolate clean sheep on clean ground that has been free from all sheep for 2 weeks.
- Put the infected group through foot bath.
- Hold infected sheep for further treatment; use clean ground, if possible.

### **During first week**

- Walk infected sheep through foot bath every other day.

### **End of first week**

- Reexamine all sheep in infected group.
- Retrim feet of all infected sheep.
- Hand treat feet that have been trimmed.
- Walk all sheep in infected group through foot bath.

- Establish a third (convalescent) group for animals from the infected group that appear to be healed. Keep convalescent group isolated on clean ground.
- Hold infected sheep for further treatment.

### **During second week**

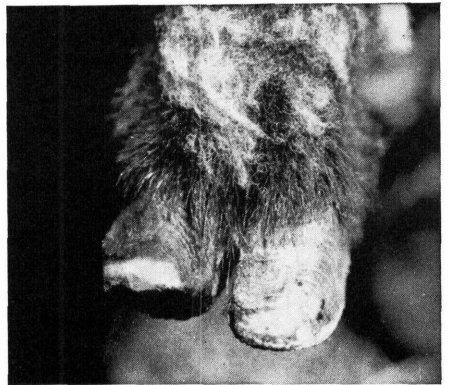
- Walk infected sheep through foot bath every other day.

### **End of second week**

- Reexamine all sheep.
- Walk clean and convalescent sheep separately through foot bath; return them to clean ground.
- Retrim feet of infected sheep, as necessary.
- Walk infected sheep through foot bath.
- Move healed sheep from infected group to convalescent group.
- Slaughter sheep that still have severely infected claws.
- Slaughter sheep with claws that have healed in a twisted or distorted manner.

### **Six-Week Schedule**

If it is not practical to maintain three separate groups of sheep in com-



**Excessively overgrown horn (left). Sheep was lame, but did not have foot rot. Same foot after proper trimming (right).**



Farm meetings of sheep owners may be part of cooperative local or State programs for eradicating foot rot.

plete isolation on your farm, treat sheep over a longer period of time. A recommended schedule:

#### **First day**

Same as page 14.

#### **During first and second weeks**

- Walk clean group through foot bath twice each week; return them to clean ground.
- Reexamine all sheep in infected group; retrim feet as necessary.
- Walk healed sheep through foot bath and move them to clean flock.
- Hand treat feet that have been trimmed.
- Walk infected sheep through foot bath and hold them in isolation.

#### **During third and fourth weeks**

- Walk clean group through the foot bath twice each week.

- Walk infected group through the foot bath twice each week.

#### **End of fourth week**

- Reexamine sheep in infected group; trim feet as necessary.
- Walk healed sheep through foot bath and move them to clean flock.
- Treat infected sheep that appear to be improving—trim and hand treat the feet, walk sheep through foot bath, and return them to infected flock.
- Slaughter sheep that still show severe signs of foot rot.

#### **During fifth and sixth weeks**

- Walk infected group through the foot bath twice each week.

#### **End of sixth week**

- Reexamine all sheep in flock.
- Walk all healthy sheep through foot bath and return them to clean ground.

- Send infected sheep to slaughter unless unusual conditions indicate further treatment will be successful.

After completing the treatment, watch the flock closely for several months to make certain that no pockets of foot rot infection were overlooked. If treated sheep become lame or show other signs of foot rot, repeat treatment or send the sheep to slaughter.

## RANGE SCHEDULE

The infected range flock presents a somewhat different problem from the infected farm flock. Short-term treatment schedules used for small farm flocks are not practicable for range flocks. Eliminating foot rot from a range flock takes a minimum of several months—and often requires a year or more. Therefore, treatment of range flocks must be continued over a long period, with modifications in the time schedule to suit range operations. The closer the range schedule can be made to conform to recommended farm schedules, however, the faster foot rot can be eliminated from the range flock.

## PREVENTION

As soon as you know that the flock is absolutely free of foot rot, set up your own program to prevent future outbreaks of the disease. To maintain sheep free of foot rot, keep them away from all known sources of the disease. Do not let the flock come in contact with infected sheep. Do not put clean sheep on recently contaminated ground.

Other preventive measures:

- Check every sheep in the flock individually for foot rot twice a year.

First, set up every animal and trim hoofs as necessary. Then examine each foot carefully for signs of foot rot. If the feet are healthy, walk sheep through a foot bath of formalin or copper sulfate as a precaution before returning them to the pasture or lot. If you find foot rot, begin eradication at once.

- Watch for lame animals. As soon as you see signs of foot trouble, catch and examine affected sheep. Treat lame sheep as necessary.
- Obtain sheep only from flocks known to have been free of foot rot for at least 6 months.
- **Make certain every newly introduced sheep is free of foot rot before moving it into your flock.** Isolate new arrivals on clean, dry ground. As soon as possible, trim, examine, and treat these animals. **Hold them in isolation for 2 weeks.** Then reexamine the feet. If sheep are free of foot rot on the second examination, move them into the flock.
- Where practicable, drain muddy corrals and pastures or fence them to keep sheep out.

- Keep pastures, lots, and grounds clean and free of sharp objects, broken equipment, and trash that could cause injuries.

A foot rot eradication program may be conducted on an individual farm, or as a cooperative effort in a community, a county or a State. For help in setting up and carrying out a cooperative drive against foot rot in your area, see your county agent, your veterinarian, State animal-disease-control officials, and organizations of sheep growers.